

IN THE CLAIMS:

Please add new Claims 25 to 30 as shown below. The claims, as pending in the subject application, read as follows:

1. (Original) A high frequency electrical signal control device, comprising a transmitter for generating a high frequency electrical signal, a receiver, a transmission line for propagating the electrical signal, and a structure for radiating the electrical signal propagated through the transmission line to the space or receiving a signal from the space, wherein a degree of coupling of the electrical signal between the space and the transmission line provided by the structure can be variably controlled.

2. (Original) A high frequency electrical signal control device, comprising a transmitter for generating a high frequency electrical signal, a receiver, a transmission line for propagating the electrical signal, and a structure for radiating the electrical signal propagated through the transmission line to the space or receiving a signal from the space, wherein:

the structure has a movable portion; and  
directivity of an electromagnetic wave radiated to the space can be controlled in deflection.

3. (Original) A high frequency electrical signal control device

according to claim 1, wherein an antenna is provided as the structure so that intensity or directivity of an electromagnetic wave radiated or received through the antenna can be made variable.

4. (Original) A high frequency electrical signal control device according to claim 1, wherein:

the transmission line is a microstrip line, a co-planar line, or a co-planar strip line constituted by a plane circuit; and

the structure is formed on the plane circuit.

5. (Original) A high frequency electrical signal control device according to claim 4, wherein:

a movable portion for turning ON/OFF an electrical contact is provided, the movable portion being formed on the plane circuit; and

a degree of coupling of the signal between the structure and the space can be variably controlled by the movable portion.

6. (Original) A high frequency electrical signal control device according to claim 3, wherein:

the transmission line is a waveguide having a rectangular or circular cavity;

the antenna is a horn antenna having a similar cavity; and

it is possible to carry out at least one of an operation for changing a positional relationship between an input portion of the horn antenna and the waveguide to

change the magnitude of the degree of coupling, and an operation for changing a direction of an output unit of the horn antenna to carry out scanning for the directivity of an electromagnetic wave radiated to the space.

7. (Original) A high frequency electrical signal control device according to claim 3, wherein a photonic crystal or a lens is integrated on a surface of the antenna to emit an electromagnetic wave having high directivity through a narrow-emission angle.

8. (Original) A high frequency electrical signal control device according to claim 1, wherein a circulator is integrated in the transmission line such that an electrical signal is caused to flow in one direction among the transmitter, the receiver, and the structure connected to the transmission line.

9. (Original) A high frequency electrical signal control device according to claim 1, wherein a frequency ranging from a millimeter wave band to a terahertz wave band (30 GHz to 30 THz) is used as a frequency of the high frequency electrical signal.

10. (Original) A high frequency electrical signal control device according to claim 1, wherein the transmitter and the receiver are integrated on the same substrate.

11. (Original) A high frequency electrical signal control device according to claim 1, wherein:

the transmitter for generating the high frequency electrical signal applies a pulse laser beam to a gap defined between two conductors which are provided on a surface of a photoconductive film and across which a voltage is applied;

the receiver obtains an electrical signal from a current caused to flow between the two conductors in the same construction;

the reception can be carried out only at a timing when a part of the same pulse laser beam is applied to the gap between the two conductors of the receiver; and

means for allowing control of an amount of beam delay is provided in the middle of an optical path through which the pulse laser beam is guided to the receiver.

12. (Original) A high frequency sensing system, wherein propagation of an electromagnetic wave through the space is controlled using the high frequency electrical signal control device as claimed in claim 1 to wirelessly inspect constituent elements, a permittivity distribution state, positional information, and the like of a surface or an inside of an object.

13. (Original) A high frequency electrical signal control device, comprising a generator for generating a high frequency electrical signal which serves as an element for converting a laser beam into an electromagnetic wave having a frequency lower than that of the laser beam, wherein a laser device for generating a laser beam, an optical waveguide for propagating the laser beam to guide the laser beam to a generator,

the generator, and a transmission line for propagating the signal are integrated on the same substrate.

14. (Original) A high frequency electrical signal, control device according to claim 13, wherein the generator has a waveguide type structure so as to be coupled to the optical waveguide for propagating the laser beam.

15. (Original) A high frequency electrical signal control device according to claim 13, wherein a detector and a transmission line for propagating the signal to the detector are further integrated on the same substrate.

16. (Original) A high frequency electrical signal control device according to claim 14, wherein a dielectric member constituting the optical waveguide and a dielectric insulating layer constituting the transmission line are formed of the same member.

17. (Original) A high frequency electrical signal control device according to claim 13, wherein:

the laser device includes two devices having different oscillation wavelengths;

beams emitted from the two devices are mixed with each other in a Y-branch optical waveguide formed on the same substrate; and

an electrical signal having a frequency corresponding to a difference in frequency between the two devices is generated from the generator.

18. (Original) A high frequency electrical signal control device according to claim 13, wherein:

the laser device is comprised of a semiconductor mode lock laser adapted to generate a short pulse having a pulse width of equal to or shorter than 10 psec; and an electrical signal of a short pulse is generated by the generator.

19. (Original) A high frequency electrical signal control device according to claim 18, wherein:

an optical output of the semiconductor mode lock laser can be guided to the detector as well through the optical waveguide formed on the same substrate;

the optical waveguide for guiding the optical output of the semiconductor mode lock laser to the detector is provided with an optical delay unit for changing an amount of delay; and

a time waveform of the electrical signal of the short pulse is measured while the amount of delay is changed.

20. (Original) A high frequency electrical signal control device according to claim 13, further comprising an antenna capable of radiating/receiving an electromagnetic wave to/from the space, the antenna being provided in the transmission line.

21. (Original) A high frequency electrical signal control device according to claim 20, further comprising means for deflecting a direction of the electromagnetic wave radiated from the antenna.

22. (Original) A high frequency electrical signal control device according to claim 13, wherein a frequency ranging from a millimeter wave band to a terahertz wave band (30 GHz to 30 THz) is used as a frequency of the high frequency electrical signal.

23. (Original) A high frequency sensing system, wherein constituent elements, a permittivity distribution state, positional information, and the like of a surface or an inside of an object placed on the transmission line for propagating the electrical signal are measured using the high frequency electrical signal control device as claimed in claim 13.

24. (Original) A high frequency sensing system, wherein propagation of an electromagnetic wave through the space is controlled using the high frequency electrical signal control device as claimed in claim 20 to wirelessly measure constituent elements, a permittivity distribution state, positional information, and the like of a surface or an inside of an object.

25. (New) An electromagnetic wave control device, comprising a substrate provided thereon with:

a transmitter for outputting an electromagnetic wave having a frequency ranging from 30 GHz to 30 THz;

a transmission line for propagating the electromagnetic wave output from the transmitter;

a receiver for receiving through the transmission line an electromagnetic wave with a frequency in the above range; and

an antenna for radiating the electromagnetic wave output from the transmitter and propagated through the transmission line to the space or receiving an electromagnetic wave with a frequency in the above range from the space and inputting it into the receiver through the transmission line,

wherein the device has a switch for selecting either one of a first state where the electromagnetic wave output from the transmitter is directly input into the receiver through the transmission line, and a second state where the electromagnetic wave output from the transmitter to the transmission line is radiated to an outer space through the antenna or an electromagnetic wave with a frequency in the above range is received by the antenna and input into the receiver through the transmission line.

26. (New) An electromagnetic wave control device according to claim 25, wherein the switch is adapted for selecting either one of the first state where the electrical connection between the transmission line and the antenna is in the OFF state and the second state where it is in the ON state.

27. (New) An electromagnetic wave control device according to claim



25, wherein the transmission line is a microstrip line, a co-planar line, or a co-planar strip line constituted by a plane circuit, and the antenna is formed on the planar circuit.

28. (New) An electromagnetic wave control device according to claim 25, wherein the transmitter and the receiver are integrated on the same substrate.

29. (New) An electromagnetic wave control device according to claim 25, wherein the antenna is supported by a torsion spring and provided on a dielectric member rotating about the axis of the torsion spring.

30. (New) A sensing system using an electromagnetic wave control device according to claim 25, comprising irradiating an object with the electromagnetic wave output from the transmitter via the antenna and carrying out a sensing in respect of the object based on reflection information of the electromagnetic wave reflected by the object or transmission information of the electromagnetic wave transmitting through the object.